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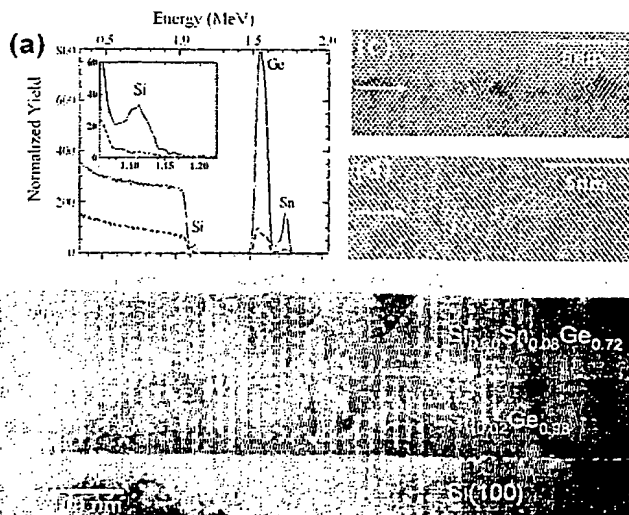
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(54) Title: $\text{Si}_x\text{Sn}_y\text{Ge}_{1-x-y}$ AND RELATED ALLOY HETEROSTRUCTURES BASED ON SI, GE AND SN



(57) Abstract: A novel method for synthesizing device-quality alloys and ordered phases in a Si-Ge-Sn system uses a UHV-CVD process and reactions of SnD_4 with SiH_3GeH_3 . Using the method, single-phase $\text{Si}_x\text{Sn}_y\text{Ge}_{1-x-y}$ semiconductors ($x \leq 0.25$, $y \leq 0.11$) are grown on Si via $\text{Ge}_{1-x}\text{Sn}_x$ buffer layers. The $\text{Ge}_{1-x}\text{Sn}_x$ buffer layers facilitate heteroepitaxial growth of the $\text{Si}_x\text{Sn}_y\text{Ge}_{1-x-y}$ films and act as compliant templates that can conform structurally and absorb the differential strain imposed by the more rigid Si and Si-Ge-Sn materials. The SiH_3GeH_3 species was prepared using a new and high yield method that provided high purity semiconductor grade material.

**Declarations under Rule 4.17:**

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE,

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